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Contents of Thesis.

Thesis

for the Degree of Doctor of Medicine,

University of Glasgow,

by James Andrew Neptune Scott M.B., C.M.,

Warrnambool, Victoria,

entitled,

"The Diagnosis and Treatment of Echinococcus Cysts."

The subject of the Diagnosis and Treatment of Echinococcus Cysts, or as they are commonly called "Hydatids", is one of interest to surgeons in all parts of the world from the wide spread distribution of the disease, its peculiar nature, and the protean forms under which it manifests its presence. From its power of attacking any organ in the body the general practitioner and the specialist are alike interested in it, and meet on common ground in its discussion.
This disease is moreover one of the greatest importance to the Australian surgeon from its extreme prevalence, and the idea of hydatids always lurks largely in his mind when called upon to decide the nature of any new formation. Of all the colonies, Victoria is most subject to the Hydatid disease, which is believed to be increasing more rapidly than the spread of the population.

About one case in every hundred and seventy admitted to our hospitals is a case of hydatids, and this ratio is much less in the more infected areas, including the northern and western portions of the colony.
The annual mortality from Echinococcus disease is about .3 per cent of the total deaths, and has lately been increasing owing to the disease becoming more prevalent, and also to the fact that is is now better known and recognised by the public and profession, and death from it is less likely to be attributed to other affections than formerly.
Hydatid disease requires, for its proper recognition and treatment, a knowledge of the life history of the parasite which causes it. This knowledge is but of late acquisition, and by no means yet perfect; further researches into the aetiology, pathology, and clinical history of the Echinococcus may materially modify our treatment of it in the future.
It is well known that many cysts from their situation are quite beyond the reach of discovery prior to death, which may be directly due to them, for instance those in connection with vital organs, as the heart or nervous centres; and many others require no other treatment than expectant, during the spontaneous evolution of the cysts by the natural channels of the body.
Of late years the brilliant results of radical operations on hydatid cysts in dangerous situations, lead us to hope that fewer cases will be left to run their uncertain course,

and more brought under the surgeon's control, than heretofore; and the current of medical opinion is certainly tending towards the conviction that nothing short of complete extirpation of the parasite from the system fulfils the demands of modern surgical science.
Starting with the at present ascertained facts regarding the echinococcus disease in relation to man, I will collect, from the leading authorities on the subject at my disposal, the most approved means of discovering and combating this ailment: and will endeavour to point out the principal elements of success and failure in diagnosis and treatment, from cases which have come under my own observation.

Part I. Diagnosis of Hydatid Cysts.

The symptoms attending the presence of the taenia Echinococcus in the human body in a larval or cyst-like form may be conveniently divided into constitutional and local, though the former are generally noticeable from their absence in proportion to the local affection. As a rule the general health is not interfered with unless some degeneration or accident takes place in the development of the disease, or when the functions of neighbouring organs of vital importance are disturbed by the pressure of the tumour on them.
For instance, the hydatid may undergo degeneration following the death of the parasite from some cause or other, such as the absorption of bile or of intestinal

contents (faecal matters gases,) by a process of endosmosis, and the introduction of putrefactive germs into the cyst may induce a suppurative process therein, leaving an abscess which may be of large extent. A condition of septicaemia quickly follows and the patient is attacked by all the symptoms associated with absorption of the products of decomposition; pyrexia rigors clammy skin, exhaustion, &c.; and if the abscess should chance to open into a blood vessel, phlebitis or even pyaemia accompanied by metastatic abscesses throughout the system may result.

On the other hand a more sudden termination of the existence of the cyst may imperil the life of the patient and exhibit grave symptoms. The cyst may rupture - from the effects of increased pressure within the sac, or from external violence. Should the hydatid be living at the time and the rupture not take place into a vital region, beyond the history of sudden subsidence of the tumour, and of shock following the accident we may have little to guide us in determining the nature of the growth, which however may be succeeded by numerous smaller tumours throughout the cavity (generally the peritoneum), from the transference of the living scolices to its walls, to which they adhere, and where they develope new cysts.

Should this rupture take place into the pericardium or pleural cavity, death may be almost instantaneous from the severity

of the shock, especially in the case of the former cavity where the irruption of the contents of any considerable cyst has invariably proved fatal; rupture into the pleura if recognised early being much more hopeful for operative procedure.

Rare cases have been recorded by Luschka, Piorry and others of rupture into the systemic circulation particularly into the vena cava inferior, leading to collapse and asphyxia with speedy death.

More commonly when hydatids rupture, they do so into a region in communication with the exterior of the body and are voided per vias naturales. The discovery of cyst contents that have been got rid of in this manner by the patient form perhaps the most important link in the diagnostic evidence of the presence of hydatids in certain organs, notably those in the lung and kidney, and more rarely, those in connection with the alimentary canal.

The history of such a case as frequently related by patients who have suffered from some obscure chronic pulmonary affection is as follows:— The patient has been troubled more than usual with a dry cough and shortness of breath, usually worse on lying down, (when the position aggravates the pressure symptoms of pulmonary hydatids as a rule), and when in the act of coughing, there is a feeling of something having given way, and a quantity of fluid is brought up into the mouth and expelled in a

paroxysm of coughing. This fluid is described as of a salty flavour in the mouth, and is usually followed by the expulsion of pieces of membrane from the cyst wall. The only danger consists in the quantity of fluid and cyst membranes expelled at the time, for if large, the patient may be asphyxiated from the flooding of the lungs and the obstruction at the glottis, an accident predisposed to by the advanced age or debility of the patient.

Small cysts may be passed per urethram from some portion of the urinary tract; and when hydatids rupture into the alimentary canal, the cyst contents are found among the dejecta; with vomiting as an additional symptom, should the tumour escape into the stomach.

A certain amount of bleeding always accompanies the escape of hydatids, which may show itself as haemoptysis, haematemesis, &c, and if the bleeding should be excessive the patient may become very pale and anaemic. This process is the normal termination to many cases, and often leads to a complete cure, as the tendency is for all the cysts to rupture and be expelled when the pressure is relieved and a passage opened for their escape.

This bleeding has proved rapidly fatal in exceptional cases.

Occasional cases have been chronicled where the echinococcus cysts had burst through the abdominal or thoracic parieties, after the pressure had gradually thinned them.

The observation of the pressure symptoms of the hydatid cyst often affords strong suspicion or absolute proof of its presence in a particular organ, and is most valuable when the other signs are wanting, and when other affections producing similar effects can be excluded.
In this regard the mind is often forced to the comparison of this affection with the condition found in obscure cases of thoracic aneurism, for in both we may have to rely upon the effects upon near and distant organs produced by the pressure of the tumour;- on cavities and canals, on blood and lymph vessels, or nervous cords and ganglia; necessitating considerable anatomical knowledge for the localisation of the disturbance and the comprehension of the means by which these remote effects are induced.
For example;- a cyst in connection with the lower surface of the liver may compress the bile-ducts and cause jaundice; or the portal vein and be followed by ascites and haemorrhoids. Should the lower vena cava be obstructed we will have varices and anasarca in addition, while the heart, lungs, stomach and intestines are almost sure to be more or less displaced by a large cyst in this region and their functions interfered with. If abdominal, the breathing may cease to be abdominal and become entirely thoracic, the kidneys or ureters may be compressed, and uraemia, hydronephrosis, purpical kidney, &c. set in, and one or both legs may become swollen.

From its situation, the thoracic duct is rarely implicated, but has been found occluded by a cyst in subjects whose death had resulted from defective nutrition.
Should the cyst be invading the cavity of the thorax, we should expect to find dyspnoea and occasional attacks of syncope, enlargement of the veins of the neck, arm and chest, pain in the course of the intercostal and humeral nerves, and functional disturbance of the circulation through the medium of the vagus and sympathetic nerves.
An hydatid cyst in the Cranial Cavity may affect the general health by pressing on the central nervous system and causing the intellect to be impaired; or epilepsy, hemiplegia and paralysis of the special sense-organs may be present from a similar reason.
All these special indications of the existence of hydatids in the system will be treated of more fully in considering the symptoms of the disease in the various organs.
These cysts may occasionally, by the irritation they excite, become a predisposing cause of organic disease in the organs they affect; and if this should prove to be malignant, may thus aid in further imperilling the patients condition, or even his existence.
Among the constitutional symptoms upon which less reliance can be placed than in the case of the foregoing, may be mentioned the gradual onset and development of the disease, but this may be partly

discounted by the fact that the patient seldom recognises its presence till far advanced. As a rule, the echinococcus cyst is seldom apparent until after two or three years' growth, except in the vital organs; and it may even enjoy as many as ten years of undisturbed existence should it happen to be situated in an unimportant region. Patients suffering from hydatids frequently complain of a sensation of the presence of a tumour, and a feeling of weight and uneasiness in the locality to which they ascribe it. So far may this uneasiness go, that the patient may never be satisfied until the case is cleared up, and presents himself to one medical adviser after another until he meets with one, who, owing the advancement of the disease, or the employment of a more thorough physical examination, is rewarded by the discovery of the true nature of the affection. The value of systematic searching physical examination is better demonstrated in no disease than in hydatids.

Wasting accompanies many hydatid cases, particularly in those of tender years, and in cerebral cases. The extremities suffer most. I have observed that in female patients the development of the hydatid tumour is usually accompanied by a failure in the reproductive functions, which is indicated by the gradual cessation of the menses, and the wasting of the breasts. Among the married, also, sterility

is common. I can find no reference to this in the literature of the subject, and can offer no explanation of the matter further than that the growth of the parasite may induce some exhaustion of the vitality of its host, as may be shown in other ways in this disease and indeed in the whole category of parasitic diseases. What is equally strange is that these symptoms as a rule disappear after the removal of the disease. In one case of a young female with a large hepatic cyst, menstruation had ceased during several months, and the mammae were insignificant in size. A week after I had opened and drained the cyst, I was surprised to find that the patient was menstruating, and the breasts soon after began to rapidly increase in size. I have also been informed of instances of women who had long been regarded as barren, becoming pregnant after the extirpation of the hydatid cysts. This abolition of the menstrual molimina I regard as of great interest and importance, and I believe, when further authenticated, it may even become a point in the diagnosis of the sometimes very obscure cases of hydatids in which it occurs.

It is however the local symptoms on which we place most reliance in the diagnosis of hydatid cysts: When we consider that we have here a slowly growing tumour which only affects the general health indirectly, it is manifest that we have to depend mainly on the methods of physical diagnosis for its discovery.

The cystic tumour may be very small & so escape detection, or so large as to make its boundaries incapable of definition, as when the entire abdomen is filled with the growth.

There may be one tumour, or an infinite number of cysts scattered throughout the body; and again, each individual cyst may be uniocular, or may contain numerous daughter and grand-daughter cysts. The contents of the cyst may be fluid, or have undergone degeneration into pus and debris, which in old cases may be found in a solid caseous condition. The walls of the cyst may be thin and composed of the normal ecto- and endo-cyst, or they may be surrounded by an adventitious tunic derived from the neighbouring tissues, and each or all of these coats may be the seat of calcareous infiltration. It will be easily seen that the local signs are entirely modified by the condition of the tumour, and that evidences which are diagnostic of one stage of the disease are of no value whatever in another.

If near the surface of the body the tumour is in most cases detected by the eye as a more or less localised swelling. The most important fact about the swelling is that it is unsymmetrical, an observation to be confirmed by comparing the measurements of the affected and normal corresponding parts of the body, and in the case of the trunk by means of a cyrtometric tracing. A difference of two or three inches is commonly met with between the two sides of the chest or thorax; or between the circumference of two limbs, at the same level.

These measurements may show a slight increase from time to time in the case of living hydatids.

On palpation, the cyst is felt to be more or less rounded or crescentic at its free margin if the growth be large and single; but if numbers of small cysts are present, they give the hand the sensation of an irregular knotted surface. The tumour feels tense and elastic, and can seldom be indented by the finger-tips. The peculiar degree of tenseness felt on palpating healthy echinococcus cysts is almost sufficient to establish the diagnosis when one has acquired sufficient practice in handling them.

Should suppuration occur, the parasite dies and the tension falls, the tumour then feeling soft and boggy.

The tenseness felt over normal hydatids

is due to the extreme elasticity of its cyst-wall and also to free transudation into the cyst. This is so marked that I have seen cysts of the subcutaneous tissues mistaken for cartilaginous tumours, which, when incised, ejected their contents to some distance from the body, and then collapsed by the curling up of the ectocyst (or chitinous layer.) It is to this unyielding hardness that the hydatid owes its power of displacing every tissue of the body with which it comes in contact; it is found occupying almost the entire cavity of the cranium, or filling the liver, or eating into and forcing apart the hardest bones. All must retreat before its advance.

To this is also due the fact that it is next to impossible to induce fluctuation in the cyst unless the parasite has died, or the fluid contents have suppurated or partly escaped from the cyst-cavity; thus lowering the tension sufficiently to enable a wave of fluctuation to pervade the cyst.

The so called Hydatid Fremitus, to which so much attention has been directed, is described as a species of fluctuation, elicited on striking the back of the middle finger of three placed over the tumour. The two outside fingers receive a sensation of shaking or quivering, like that of a mass of jelly, which is said to be due to the striking together of daughter cysts within the parent-cyst. It may be occasionally

present but it must be regarded as totally unreliable in the diagnosis of hydatids, since its existence is denied by several good authorities and all are agreed that it cannot be discovered over a single hydatid vesicle. It is also said to be necessary that the cyst should not be too much distended. As far as my own observation of a large number of cysts goes, I have never yet been able to obtain the tremor. Of course both fluctuation and thrill will be wanting if the walls of the tumour be much thickened, or the seat of bony deposit.

The mobility of a hydatid cyst depends entirely on its source and environment. Should it be connected with the diaphragm it will be observed to follow the respiratory movements of that muscle, unless it be so large as to prevent its moving at all. If situated over a large bloodvessel it may transmit the pulsations, which may be sensible to both eye and hand. Except in the earliest stages, adhesions quickly surround the cyst and limit its movement especially in the large serous cavities. However the hydatid cyst is occasionally very mobile, do when it grows in connection with the omentum, or when it is provided with a pedicle. Pelvic hydatids, if small, are very mobile on palpation, as they are prevented from forming adhesions

by the movements of the pelvic diaphragm; but when large, they rise out of the pelvis and establish connections with surrounding parts which bind them down.

Cysts of the muscles and subcutaneous tissues are freely movable, do not form adhesions, and the skin plays readily over their surface.

On percussion, we get dulness over the surface of the tumour, and can thus often accurately mark out its limits; also a varying degree of resistance, depending upon the condition of the contents and coats of the cyst.

Owing to the fixity of the tumour, the area of percussion dulness is usually unaltered by the position of the patient.

The results obtained by the exploratory puncture of the tumour and the withdrawal of a portion of its contents are occasionally very valuable, and are in fact, in most cases, the only certain means of diagnosis.

This little operation is performed by inserting into the cyst an aspirator of small diameter, which is preferable to the use of a grooved needle or hypodermic syringe, because, owing to the air being exhausted behind the needle, immediate indication of the existence of fluid is obtained when the instrument enters the cyst, whereas with the ordinary needle or syringe the cyst may be completely transfixed, damage may be done, and no fluid obtained after all.

This proceeding gives negative results when the cyst-contents are dried up, or when the needle is blocked up with ectocyst. Gardner recounts a case (Transactions Aus. Med. Congress 1889) where the puncture was unsuccessful in getting fluid, but on blowing through the needle on to a microscopic slide, a number of hooklets were found. This precaution should never be neglected.

The normal hydatid fluid is perfectly clear and limpid, pale yellow in colour, & with a faint odour and salty taste. The reaction is neutral or alkaline, and the specific gravity varies between 1005 and 1015. It contains no albumen, but abundance of chlorides of sodium and potassium. The other constant constituents are leucin tyrosin, succinic acid, inosite, and phosphate, sulphate, and carbonate of sodium.

Albumen or mucus may be present in small amount when any serum or mucus enters the cyst after puncture or rupture (but not otherwise.

The following table is an average taken from the tables of percentage of the constituents of normal hydatid fluid according to Hayem, Jacobson, Munk, Wyss Heintz, Scherer; who are quoted by Davies Thomas in his work on Hydatids:—

Water - 97·4

Solid matters - 2·6, consisting of Chloride of sodium, ·524; Succinic acid, ·341; Sugar, ·404; Leucin and Tyrosin small amounts; Traces of Inosite Urea Creatin, phosphate, sulphate and carbonate of sodium and a variable amount of other inorganic matters.

In cases where the cyst is in connection with a secreting organ the fluid is apt to be altered by the imbibition or rupture through the walls of the vesicle of the products of that organ. For instance, hydatids in connection with the liver frequently contain bile, which has effused into the sac, producing a green or yellowish discolouration of the fluid and membranes, and yielding the characteristic tests for bile pigment. In old cases, the bile deposits reddish crystals of bilirubin, which are soluble in chloroform, and give the colours of bile pigment with Gmelin's test. Crystals of cholestearin are occasionally found in the cyst in similar cases.

Should the cyst communicate with the kidney we find deposits of uric acid or oxalates and phosphates in the fluid. By the examination of the fluid drawn off we obtain important evidences of the precise site of the tumour.

Blood may be effused into an hydatid cyst & may be found in the fluid by the usual microscopic, chemical and spectroscopic tests, but in old cases the blood pigment is dissolved out of the corpuscles and deposited as haematoidin crystals.

When the parasite has undergone degeneration the fluid becomes more or less purulent, with debris of membranes, scolices hooklets, &c. floating in it, and fatty crystals are found in the deposit. Turbidity of the fluid points as a rule to suppurative changes.

If we pour some of the removed fluid into a clear vessel and hold it up to the light, we can often see a great number of small whitish specks floating about in the fluid without affecting its transparency. These particles are scolices and hooklets with minute bits of the cyst wall and brood-capsules which, have been able to pass through the fine lumen of the aspirating needle, and may be verified under the microscope with a low power. The characteristic appearances of hydatids under the microscope are;— the complete or ruptured brood-capsule with enclosed scolices, or the latter free, or adherent to the cyst wall; the stratified chitinous ectocyst, which is perhaps the most constant sign, persisting long after the entire disappearance of the other contents; and the hooklets, which may be found single, or arranged in a circle, being attached to the head of the echinococcus.
The microscopic appearance of these structures is too well known to require description.
Occasionally the microscopic examination of hydatid fluid gives negative results, from the absence of solid particles in it, or from their being in an unrecognisably degenerated condition. In such a case, much difficulty may arise in its differential diagnosis from other fluids having similar physical characters. In the case of abdominal cysts, there may be confusion in determining between the fluids of a hydatid and an Ovarian cyst.

The latter may be of low specific gravity, free from albumen, & contain abundant chlorides; along with an imperfect history of the case. Mistakes are frequently made and correct diagnosis seldom by even the most practised, between parovarian and hydatid cysts. Dropsical effusions in the anaemic and hydraemic also greatly resemble hydatid fluid. As an aid in the diagnosis may be mentioned the small granular ovarian cells described by Drysdale as occuring in ovarian fluid; and the presence of succinic acid and sugar in most samples of hydatid fluid, the latter being recognised by Trömmer's test, while succinic acid is readily obtained by dissolving a concentrated solution of the fluid in boiling nitric acid and water, (1 part in 3), and evaporating the mixture, when the acid is crystallized out in colourless prisms. The exploratory puncture occasionally gives rise to alarming constitutional symptoms, especially in the case of abdominal hydatids. In a typical case, the history is as follows;— a day or two after the operation, the patient complains of violent pain in the abdomen, which is accompanied by high fever, giddiness and vomiting. The patient's face betrays great anxiety and sometimes collapse, the pupils dilate, and the heart becomes very feeble. The symptoms point to peritonitis and appear very grave. However, the case culminates in great itchiness of the skin, followed by a rash, appearing first on

the abdomen and chest sometimes on the face, and spreading thence to the limbs. Immediately, the patient gets relief from all the pressing symptoms, and after a few days the rash fades and disappears. This is the so-called "Hydatid Rash", it is a true urticaria, with hyperaemia of the skin and numerous large wheals over its surface, some redness being left after they disappear.

No treatment is required, beyond the administration of sedatives to relieve the pain. The rash is of no great importance in itself, but may aid or confirm the diagnosis if the examination of the fluid removed by puncture yields negative results.

Dr. Verco (Aust. Med. Gaz. 1882) recounts a case where the hydatid rash appeared, before the cyst was operated on, along with sickness and giddiness.

Part II. Treatment of Hydatid Cysts

It is advisable to arrange the subject of the treatment of hydatid disease under three heads:- viz, 1. Prophylactic, 2. Medical, 3. Surgical.

1. The prevention of hydatids is a question that is of great importance in infected districts, where the inhabitants are often ignorant of the means whereby the disease is spread and by their habits directly assist in their own infection.
This is now recognised by the Health Authorities in most of the Australasian Colonies, and circulars embodying the most improved methods of limiting and eradicating the disease have been distributed among the people. (vide Appendix.)
The principal source of infection is undoubtedly the drinking water, which has become contaminated by the ova, voided by domestic animals getting access to it. Such water should always be boiled before use so as to destroy the parasite. The custom of tea drinking is the salvation of people living in the Australian bush from hydatids, for the watercourses in the interior of the country are in many instances full of fluke and hydatids, as sheep, dogs cats and other animals are often dependent on a single water supply which they partake of in common with their masters. Owing to the isolated life in many quarters, and to the number of sheep & cattle raised, dogs are very

numerous and indeed a necessity, and are admitted to very close companionship with the human inhabitants; so that there is great opportunity for the infection to be spread by the desiccation and dispersal of faecal matters, and by household animals and their masters drinking and eating from the same utensils. The number of dogs and cats should be limited as much as possible, as well as their opportunity of getting access to the water conserved for drinking purposes. They should also be prevented from eating the offal of slaughterhouses which often contains hydatid cysts from the bodies of sheep and cattle.

Besides these precautions, the use of raw vegetables and of lettuces and watercresses growing in infected localities and drains should be avoided, unless thoroughly purified by prolonged washing, or by cooking.

When we consider how fatal a disease hydatids is, and how easily communicated, it is evident that the most stringent means of limiting or eradicating it should be adopted.

In the Appendix, page 77, will be found a copy of the circular issued by the Central Board of Health, Melbourne, for distribution among the inhabitants of hydatid-infected districts of the Colony.

2. Purely medical treatment has been proved uncertain or inefficacious in dealing with hydatid cysts, but it often proves a useful adjuvant to surgical treatment, or aids in the spontaneous expulsion of the cysts, or serves to palliate cases unfit for operation.

Various vermifuges have been used with the idea of destroying the parasite such as Kamala turpentine, and these have been credited with the cure in cases where the cyst has disappeared from other causes. Calomel and Iodide of Potassium have been tried with similar results.

The application of cold externally to lower the vitality of the organism and thus lead to its death is a very uncertain experiment. Dr Charles Smith of Victoria claims good results from a method of treatment tried by him, consisting in the abstinence from fluids and the adoption of a dry diet similar to that used in endeavouring to limit the quantity of an effusion in pleurisy. He combines with this small doses of Iodide of Potassium. The hydatid is said to undergo a process of desiccation, which may hasten its removal from localities such as the lung, where it is in communication with the exterior of the body by means of the bronchi, and where it may be beyond the reach of operative procedure. In such cases the treatment is logical enough, and worthy of a trial. A complete account of the treatment, with results, is given in the

Transactions of Aust. Med. Congress, 1889. (Discussion on Hydatid Disease).

During the expulsion of the cyst by any of the natural channels of the body suitable medication may facilitate its removal. Stimulating expectorants assist the lungs and bronchi in getting rid of the membranes left after rupture of the cyst. As a rule, I find most benefit from the administration of guaiacol, 5 or 8 drops given thrice daily in wine, as the antiseptic action of the drug seems calculated to prevent the invasion of the crippled lung with tubercle, as often happens in neglected cases.

Obstructions of the bile duct with hydatid membranes, or cysts, are often relieved by cholagogues, and renal colic from a similar cause by diuretics.

In cases unfit for operative procedure we can only employ palliative or sedative treatment. A valuable remedy in the headache, which always accompanies intracranial hydatids, is bromide of potassium.

The patients strength must be maintained during the disease and especially after the severe operations sometimes necessary. Tonics, such as Iron and Bark, Cod liver oil, are useful; and abundance of good food, as well as stimulants, should there be evidences of collapse, is indicated.

Diseases of other organs induced by the pressure of the cyst must be treated secundum artem, for instance ascites or pleurisy ~~& ascites~~ by tapping. Septicaemia must be guarded against and treated should it arise.

3. Very many operations have been devised for the relief or cure of hydatid cysts, varying with the locality of the disease in the body, and the results sought to be obtained. It is necessary to attempt to classify the various methods before discussing them seriatim, and I have adopted the tabulation of Davies Thomas, with a few modifications in detail, as it seems the clearest among so many confusing lists compiled by various authors.

The surgical procedures are arranged under three heads:- viz

I. Those by which the destruction of the parasite, but not its entire removal from the body, is attempted, obtained by -

a) Simple tapping or aspiration, the fluid contents of the cyst being removed.

b) The injection of medicated fluids after tapping to further ensure the death of the parasite.

c) The destruction of the parasite by electrolysis.

II. Radical operations intended to remove the entire cyst with any enclosed daughter-cysts. The sac is opened and the hydatids removed, with or without subsequent drainage. The methods of doing this are as follows, -

a) The introduction and retention of a large trocar and canula, enabling the cysts to be ruptured and discharged slowly in succession.

b) Simple incision and evacuation of

the cyst, a plan suitable to the treatment of external cysts, such as those found in the bones, muscles, and subcutaneous tissues.

c) Either of the above may be applied to thoracic or abdominal section, but adhesions must be procured between the visceral and parietal layers of the pleura or peritoneum around the situation of the opening into the cyst, to prevent the contents of the tumour escaping into the serous cavity. Adhesions may be procured by,—

1. Caustics applied to surface to establish an opening into the cyst.

2. Introduction of a circle of needles into the cyst around the opening.

3. Double puncture by two small trochars near one another

4. Preliminary incision down to the visceral layer of pleura or peritoneum and the application of aseptic gauze between the visceral and parietal layers.

d) After opening the abdomen or thorax the cyst is opened at once, and the cyst wall is stitched to the parietes, after partial evacuation of its contents.

III. A third group of operations in which the fibrous adventitious sac surrounding the ectocyst is completely removed. This procedure is very serious, and seldom required.

I(a) The method of <u>tapping</u> hydatid cysts is the one usually in vogue, and was the first operation devised for their relief. It has still many supporters, but owing to its uncertainties and occasional dangers, it is gradually becoming supplanted by more radical and reliable procedures.
There is no doubt that many so-called "cures" by tapping are followed sooner or later by <u>recurrence</u>, and, though it is sometimes entirely successful in arresting the disease or facilitating its removal, yet the statistics of the results of this treatment can only be accepted with great hesitation.
About 50 per cent. of the cases are said to do well, an equal number recur.
Tapping has served best in single acephalous cysts which are free from suppuration or degenerative changes, and is not suited to multiple cysts, or cysts containing many daughter vesicles.
After puncture, the bladder-worm is killed by the shrinking and degeneration of the cyst wall, and this may lead to the hydatid being more easily expelled by the bronchi or bile-ducts &c.
This plan of treatment is not free from <u>danger</u>, for several deaths have occured after puncture of hydatids in the lung, either from shock, or more commonly from suffocation from occlusion of the bronchi with ruptured cysts or from the discharge of the contents of the highly elastic vesicle when an opening is made in its wall, so

that the patient may be drowned by the sudden rush of a large quantity of fluid. A similar inward result may happen if the fluid should burst into the abdomen during tapping, as it may do, should the patient strain or cough.

Another danger may follow tapping, due to the introduction of air and putrefactive germs into the cavity, with consequent suppuration and hectic fever. This happens usually at the end of the tapping and is due to the action of the diaphragm or abdominal muscles during the movements of respiration lowering the pressure in the exhausted cyst below that of the atmosphere. We may avoid this risk by taking aseptic measures to prevent the entrance of impure air, or by the use of the aspirator, which offers several advantages as well over the simple trocar and canula. It indicates the presence of fluid in the cyst immediately on reaching it, and is thus more applicable to young cysts than to old, or calcareous, or degenerated ones. It shows about half the mortality of simple tapping.

During aspiration of cysts within the thorax or abdomen, pressure should be made around the region of the puncture and kept up after the withdrawal of the needle to bring the serous surfaces together and prevent extravasation into the pleural or peritoneal cavity.

In many cases the cyst refills after a

few days, and may be punctured again and again, the amount of fluid diminishing each time, or the contents may become purulent and full of amorphous debris from degeneration of the walls of the vesicles. By this time, adhesions will probably have surrounded the sac, which may be freely incised, and the tumour thoroughly evacuated. Aspiration may be used as a palliative in cases unfitted for more radical operations, where it is essential to relieve the pressure for a time, as in cerebral and spinal cases.

Fitzgerald of Melbourne objects to aspiration, and prefers simple tapping, on the ground that the exhaustion of air lowers the tension so much in the sac as to cause in some cases severe haemorrhage from the rupture of the large vessels of the capsule. This is, however, a rare complication. During puncture, should alarming symptoms of shock or asphyxia, from rupture of the cyst or from bleeding into the sac occur, the rule is to freely incise the cyst and clear it out at once, as this has been found less dangerous than leaving it alone.

The conclusion arrived at, after a long experience of this treatment, is that the chief use of aspiration should be limited to diagnosis, which, if substantiated, should be followed as soon as possible by one of the radical operations for the removal of the cysts.

(b) The use of medicated injections, after tapping a hydatid cyst, has not been attended with great success, and exposes the patient to several unnecessary dangers. Among the different substances used we may enumerate the following:- Extract of Male fern, for its taenicidic action in order to destroy the parasite completely; a solution of bile also, as it is well known that the entrance of bile into cysts in the neighbourhood of the liver is soon followed by the degeneration and death of the hydatid. The injection of it however, into a partially tapped cyst has on more than one occasion had a fatal termination. Irritating substances in solution, such as Iodine Carbolic acid, Corrosive Sublimate, and Permanganate of Potassium, have been employed with the intention of setting up adhesive inflammation in the sac and so leading to its obliteration, as in the treatment of common hydrocele of the tunica vaginalis testis. The conditions are however hardly comparable, for, whereas in the latter we have to do with a simple fluid-containing sac, in the former case we have to contend with the presence of numerous organisms in the fluid which are prone to decomposition, and to inflammation which may get beyond our control. There is also some danger of these drugs getting absorbed into the system, and giving rise to poisonous symptoms. Salivation is quite common after the use of Corrosive Sublimate in this fashion.

c) As far as the use of Electrolysis in the treatment of hydatids is concerned, our information is very indefinite.

The method usually adopted is to introduce into the sac two needles about an inch or so apart connected with the negative pole of the battery, while a large positive electrode is applied to the neighbouring skin. The current is kept up for 5-15 minutes at a time and the seances are frequently repeated, until the parasite is judged to be killed and the cyst diminished in size.

I have never tried this method, and cannot speak of it with experience, but it is not likely to have many adherents.

When we consider the danger of making small punctures into a tense cyst without making adequate provision for the escape of fluid, with the certain risk of internal rupture of the cyst-contents, there are few considerations of expediency and ease in operating that should persuade us to employ this method, while there are so many superior though more formidable ways of treating this affection.

I am surprised that so eminent an authority as Hilton Fagge claimed freedom from danger and good results from the electrolysis of hydatid cysts, which has so often been followed by disastrous results. At the best it can have no advantages over simple tapping, and it is incomparably more dangerous.

II.(a). We now come to the second group of operations in which the complete removal of the parasite from the body of its host is aimed at. The first method of accomplishing this is by the introduction into the cyst from without and its retention there, of a large trocar and canula, the so-called "Canule-à-demeure" of French writers. It is found that the daughter cysts, after the evacuation of the parent bladder-worm, gradually separate from their attachments to the wall; they then rupture, from the pressure around them being lowered, and by the inner extremity of the canula perforating them; and their contents are discharged, to be soon followed by the coats of the ruptured cysts. Very small cysts may be passed entire, but this is the exception. The removal of the cysts is much expedited by irrigation of the cavity with weak antiseptic injections, which wash away all pieces of membranes, clots, &c., and prevent suppurative changes in the sac. After the expulsion of the hydatids the adventitious sac slowly contracts, and the space occupied by the tumour is then obliterated in the ordinary process of healing. The introduction of the canula may be a primary operation or secondary to a preliminary operation directed to the establishment of adhesions around the site of the intended opening, as will be described subsequently. There is no doubt that in operating on any of the abdominal or thoracic viscera, it

makes the result more certain, and is much safer, when proper adhesions have been secured. Indeed, this combination of a preliminary operation with the retained canula, is in most cases accepted by the best authorities on the surgery of hydatids, as affording by far the safest means of curing the disease, with certainty, and a minimum risk to the patient.

When skilfully performed, it is seldom followed by untoward accidents, such as are recorded by less careful and practised observers. For instance cases have occurred in which the trocar when inserted has perforated the stomach or a coil of intestine overlying the tumour, or has completely traversed the cyst, and, emerging from the distal wall of its capsule, has wounded large bloodvessels, or an important viscus, such as the bladder in the pelvis. These cases may be ascribed either to carelessness in diagnosis, or in operating, and may be entirely obviated by an exploratory operation to the surface of the cyst, in order to shut it off from a large serous cavity. The same applies to the objection that leaking is apt to take place around the tube, or that the canula may slip & allow the contents to escape, in both these cases, no harm can result if the visceral and parietal serous layers over the cyst are properly glued together beforehand, as by this means all danger of peritonitis, pneumothorax, &c. is obviated.

It cannot be denied that this treatment is rather slow, whereat some, who prefer the more showy method of removing all the hydatids at one operation, are disposed to grumble; but it is clear that the slowness of evacuation is of great benefit in itself, as it allows the surrounding organs which have been displaced or dislocated from their situations, to regain their proper positions gradually, and adapt themselves to them. The time occupied in this treatment varies, but usually extends over two or three months before the patient can be discharged cured. The external wound must not be allowed to close up as it tends to, before the whole of the cysts come away, as in case of this happening, a fresh opening may be required to remove them.
The danger of portions of cyst-wall being retained, or of suppuration starting in the sac with consequent septicaemia must be guarded against by frequently washing out the sac with dilute antiseptic lotions, such as corrosive sublimate or permanganate of potassium, which must be stopped at once and changed if any of the symptoms of the physiological action of these drugs on the system point to their absorption in the cyst-cavity.
The rupture and escape of the vesicles may be sometimes assisted by careful probing with a flexible instrument passed into the sac and gently moved about, this is sometimes followed by a rush of cysts.

The best results have been obtained in cysts lying near the surface, within convenient reach of the canula, and where adhesions can be easily obtained. The mortality of liver hydatids has been stated to be about 2% treated by the "canule-à-demeure". It is not applicable to deep seated hydatids, such as those in the lungs, or low down in the pelvis, and has proved very fatal in cysts of the spleen.

(b.) By means of <u>incision and evacuation</u> we are able to treat many hydatid cysts satisfactorily without the necessity for obtaining adhesions between the cyst wall and the surrounding tissues, for instance, in the case of cysts situated in the muscular or subcutaneous tissues, or in the medulla of long bones, and in the joints; but wherever we have to do with vesicles situated in any of the closed serous cavities, this is a highly dangerous procedure from the liability of inflammation being set up in the cavity by the escape of cyst-contents into it. Consequently, attempts to remove hydatids by this method have not been attended by much success, the mortality in abdominal cases being about 38.5 per cent, which is much higher than in similar cases treated by the canule-à-demeure, which usually maintains a free channel for the egress of the cysts. This is often wanting in cases where the cyst wall is incised, and the imperfect evacuation is not infrequently followed

by suppuration and blood poisoning. This high mortality serves to impress the absolute necessity for shutting off the contents of the echinococcus cysts from the pleural and peritoneal cavities, or their complete extirpation from them. The methods by which this is accomplished we have now to consider.

(c) Various as have been the operations proposed and carried out for the purpose of glueing the visceral and parietal serous layers over a hydatid tumour together, those on which we can place any reliance are few.

1. We may discard the treatment instituted by Recamier, in which the application of powerful caustics, such as zinc chloride or potassa fusa, to the surface of the body, gradually perforated the tissues and made an opening into the cyst, setting up adhesive inflammation in its progress, and so avoiding the dangers of direct incision. Its chief value is however historical, inasmuch as it marks a new era in the rational treatment of these cysts by adhesions. It is now completely superseded, as it is far from reliable and presents the high mortality of 33.6 per cent. Even the most successful cases are insufferably slow and tedious, requiring three and four months for the caustic to perforate the cyst, and much suffering is entailed to the unfortunate patient.

2. Mr Fitzgerald of Melbourne has contrived a plan by which a circle of curved needles, or hare-lip pins, is inserted around the proposed opening, into the outer cyst-wall. This method has also fallen into disuse, as it was found that the adhesions were weak and uncertain if the pins were aseptic, while the danger of introducing septic instruments more than overbalanced the chance of procuring firm union of the peritoneal surfaces.
Damage occasionally resulted from the bowel or omentum being transfixed by the pins. No statistics of this method are forthcoming, but the general impression towards it is unfavourable.

3. The operation of double-puncture, followed by incision, is identified with the name of Simon and Uterhart of Rostock by whom it was practised as early as the year 1866. It consists in the induction of suppuration in the cyst, causing adhesive inflammation over the tumour between the serous surfaces. The details of the operation are as follows;- A fine trocar and canula is introduced into the most prominent part of the tumour, on withdrawing the trocar some fluid escapes if the cyst is hydatid. On the diagnosis being thus verified, another canula is introduced an inch or so away from the site of the former one, and after a small quantity of fluid has been allowed to run away, both

tubes are plugged with carbolised wax, antiseptic dressing applied, and the patient kept in bed for the next few days. The plugs are withdrawn on the third day and more fluid removed in order to observe if suppuration have occurred, indicated by the altered colour and smell of the contents of the cyst. The tubes are re-plugged and examined every day or two till the desired result is obtained, when we are almost certain to have the cyst surrounded by adhesions, which will be particularly strong between the two punctures. The tubes are withdrawn, and a free incision made between the openings into the sac, which is then irrigated, and treated antiseptically. Ten to twelve days usually elapse before the sac is ready for opening.

The advantages claimed for this plan are, the fact that the diagnosis is rendered certain before the operation is proceeded with, and the likelihood of adhesions forming within the first two or three days.

The great drawback is the possibility of septic changes following the insertion of the canulae, as it is proved that perfectly clean instruments can cause but the weakest union between the peritoneal surfaces. In fact, the same objections apply to this treatment as are raised against the previously described ones. The mortality is very high being over 40%. Trendelenburg states that Simon did not disinfect his canulae, which accounts for the strong adhesions that were procured in favourable cases.

4. The greatest advance in the treatment of hydatids was the method introduced by Béjin, and also by Von Volkmann, which is always identified with the name of the latter operator. It consists of a primary operation to explore the surface of the tumour and to establish adhesions around the wound, when these are perfectly secured, the cyst is opened and drained in the usual way.
This method is perhaps the safest way of dealing with most cysts immediately under the abdominal or thoracic parieties, which really include most of the cases we have to deal with, as the bulk of them are found, as we have seen, in that neighbourhood.
For its success, it is entirely dependent on absolute cleanliness and asepticity.
The way to carry it out may be detailed thus.
The patient must be properly prepared for the operation by a day or two's rest in bed, on light wholesome food, conducive to ease in mind and body. The bowels are to be well moved the day before the operation.
The skin is to be well washed and some disinfecting agent applied over the site of the incision. No food is to be given for at least six hours previous to the operation.
The incision is to be carried down to the peritoneum, which is opened after all bleeding is checked, and a few strips of aseptic gauze, (which may be medicated with iodoform, corrosive sublimate or other suitable germicide; but should also be invariably

sterilised in dry hot air of a temperature of 150°C. before use), are inserted gently around the wound between the visceral and parietal layers. The sac may at the same time be stitched to the margins of the wound, but this is rather risky in this stage, and may lead to extravasation of the fluid or rupture of the cyst.

The wound is then dressed, and the patient kept in bed for six or seven days, when the cyst is either incised, or punctured with a large-sized canula, and washed out and drained in the usual fashion. It is usually found necessary to dress the wound and remove any loose cysts every day at first, and less frequently after about a week. As a rule all the cysts are expelled after about a month's treatment altogether.

In the case of cysts within the thorax, whether in connection with the upper surface of the liver, or with the lungs, we have usually to resect portions of one or more ribs (generally about 2 inches) in order to get sufficient room for the subsequent opening which might get closed between two adjacent ribs.

As well as the rib, it is advisable to remove the periosteum lining its inner surface, otherwise the bone may be repaired before the cyst is drained, and the opening might become obstructed, require a fresh incision to clear the way for the escape of the solid parts of the cysts left behind.

The mortality following this method of operating is low compared with previous ones, being about 1% per cent in major operations on abdominal and thoracic hydatids.

Von Volkmann's operation has become very popular of late years, and on account of its ease and certainty is displacing all previous ones. It is undoubtedly best suited for cases in which the cysts are in relation with the parietes where adhesions are easily obtained, and where there is small danger of the cyst contracting and tearing away the united margins of the incision but it is not intended to be applied to hydatids situated deep down in the abdominal cavity or pelvis, for which a special operation has been devised, to be described under our next heading.

The greatest objection which can be urged against Volkmann's operation is that the operation being a double one the amount of shock to the patient is increased, and there is delay in opening the cyst, which may be imperative if asphyxia be threatened from pressure on the lungs. However these are but rare eventualities, and must be treated as they arise.

In the case of some cysts, and particularly those of the abdominal cavity, there is considerable risk of the cyst rupturing soon after the first incision is completed, partly from some injury to the cyst in the plugging of the wound, and partly to the reduced pressure over the tumour from the division of the abdominal muscles supporting it, but

mainly to the retching and vomiting induced by the anaesthetic. I had the misfortune to lose a patient by this mishap. A few hours after the exposure and plugging of the tumour, which was an immense hydatid filling the upper half of the abdomen of a young man, who was in a very feeble state of health, the patient was seized by a violent fit of bilious vomiting, during which the cyst burst, discharged its contents both externally and into the abdomen. Death supervened in a few hours from the combined effects of the shock and asthenia.

Putting aside rare accidents, we have in this method a valuable means of treating most cases of hydatids with ease and safety by an operation, which, though an extremely delicate one, yields, in the hands of the careful and cleanly operator, brilliant results. I have performed it myself several times, and seen it done on many other occasions, and never without the best results, excepting the above mentioned case, the unfortunate circumstances of which were beyond control.

d) If, instead of a double operation to procure adhesions and to evacuate the sac, we desire to complete the process in one operation, we make use of the method first-devised for the treatment of hydatids of the abdomen and thorax by Lindemann, and first-performed by him in 1891. It was eight years after this date before the first case was reported by Kirchner. Since then, under the able hands of Lawson Tait, Landau, Gardner and others, the operation has gradually grown in favour, and, in the cases for which it is adapted, has achieved the best record of any. The number of absolute cures in abdominal cases is almost 90 per cent of the cases operated on, and the death rate only about 10%.

The abdomen is opened under strict antiseptics over the most-prominent part of the tumour, by an incision two or three inches long.

An assistant, by gentle pressure at the sides of the tumour, makes it appear more prominent in the wound.

A loop of stout aseptic silk is passed through the sac at each side and end of the wound (making four loops in all) with a strong handled needle with a large curve.

Any fluid escaping by these punctures must be absorbed at once by sponges, and prevented from entering the abdominal cavity. This effusion is most likely to occur when the hydatids are living, and the fluid in the cysts is at high pressure.

The sac is now drawn up into the wound and opened with a trocar and canula,

or an aspirator in order to draw off some of the fluid, and thereby enable the sac to be still further exposed. A free incision is next made into it, and the contents, both fluid and solid, freely evacuated. This incision should be almost the length of the abdominal wound, the margins of which are now to be firmly sutured to the opening in the sac by stitches not more than a quarter of an inch apart.

The daughter cysts, and if possible the mother cyst, are to be drawn out gently by suitable wide-mouthed or ring forceps. The cavity thus left is to be irrigated with a mild antiseptic lotion, such as weak boracic acid, until the fluid returns clear, indicating the removal of the smaller cysts and debris of the tumour. The importance of performing this part of the operation thoroughly cannot be overestimated, as the greatest danger of the operation consists in any particles of the cyst remaining over and setting up suppuration, and possibly septicaemia.

After the syringing the cavity should be sponged out dry and closed up entirely if believed to be perfectly aseptic; if there should be any doubts about this, a wide drainage tube is left in.

Aseptic dressing is applied, and changed every day if necessary. The stitches are removed at the end of a week. Convalescence is earlier by this method than by any other, and two or three weeks usually sees the patient cured.

In the cysts situated in the lung, or on the upper surface of the liver, the operation is modified by the removal of an inch or two of one or more ribs, in order to give room to expose the tumour properly. In all other respects, cysts of the above localities are treated precisely as those of the abdomen. In the later stages of the case, we may have to do with a cavity in the chest, left after evacuation of the cyst, which, on account of the rigidity of the thoracic wall, is slow in closing; it may then be necessary to resect portions of several ribs over the cavity, in order to allow the chest-wall to collapse, and thus obliterate the cavity.

Lindemann's operation can be applied to all cases of abdominal hydatids, but is especially favourable for tumours which can be approximated to the parietal wound. Very deep cysts require considerable traction to draw them out, and this may be sufficient to rupture them if the coats of the vesicle are not perfectly healthy. If the cyst is deep in the pelvis, or at the back of the abdominal cavity and cannot be brought into the wound, the contents must be drawn off as carefully as possible to avoid contamination of the peritoneum, and after being sponged out clean may either be left to its fate, or a drainage tube may be introduced into it through the external opening. No two cases are treated quite alike, everything must be left to the general knowledge and judgment of the operator.

III. To make the classification of the various surgical operations complete, we must include a third variety, in which the hydatid is entirely removed, along with the fibrous sac surrounding it, which is derived from the other tissues in which it lies.
This is entirely unnecessary in most cases, as, after the removal of the parasite, the adventitious sac either shrivels up and gives no further trouble, or is absorbed. It is, besides, attended with considerable danger in removal, as owing to its vascularity, (its function being the nourishment of the bladder-worm) there is often great haemorrhage and collapse, which has frequently proved fatal.
Pedunculated hydatids growing from the liver and elsewhere, may be ligatured and removed along with their fibrous capsule; these are about the only cases in which good results follow the complete removal of the envelope of the cyst. Retro-peritoneal cysts removed through an abdominal opening with removal of part of the fibrous sac, & suture of the remainder to the wound, have not terminated favourably, as most of the cases reported by Spiegelberg (Archiv f. Gyn 1870-2), Whitcombe and others (Brit. Med. Journal, from time to time), died soon after the operation from collapse, or suppuration in the remainder of the sac.

Part III. Special Diagnosis and Treatment of Hydatid Cysts in the various organs.-

(a) Liver. This organ is the most common seat of the hydatid tumour, about half of the total cases occurring there, this is explained by the fact that the ova of the echinococcus reach the liver first - by the portal system, and also by the slowness of the circulation favouring the deposition of the parasite. Any part of the liver may be affected, and the cysts may be single or multiple.
The organ is increased in size, both by the presence of the tumour in the affected part, and also by a compensatory hypertrophy of the other portions, but the latter enlargement is one merely of degree, while the former is one of kind - the normal shape being entirely altered by the cyst.
The cyst may extend from the surface of the liver in any direction, it may be found as high as the 2nd rib, or low down in the pelvis. We may find it on the upper surface of the liver, bulging the intercostal spaces, or even the ribs and sternum.
Any organ in its neighbourhood may be displaced, especially the lungs, heart, spleen stomach and intestines, owing to the greater fixture of the kidneys, they are seldom shifted. The symptoms produced by pressure on these organs have been described at length in the first part of this thesis, and need here only be referred to.
Jaundice and ascites are very rare.

It is more common to get some collapse or consolidation of the base of the right lung from upward pressure.
The spleen is frequently found enlarged, partly from interference with the portal vein, and partly by sympathy with the hepatic increase.
It is diagnostic of these enlargements of the liver that the pulmonary and cardiac symptoms are aggravated on the patient lying down, the weight then being thrown more on the embarrassed lungs and heart, while the reverse happens in the case of the abdominal symptoms, which are made worse by standing.
No pain is as a rule complained of except sometimes on exertion or when inflammation occurs over or within the cyst, when we may have a condition simulating cancer or hepatic abscess.
Pedunculated cysts are found in rare instances depending from the lower surface of the liver, and are very difficult to diagnose from a floating ovary or kidney, or an enlarged gall bladder. If the symptoms are urgent, an exploratory laparotomy is justifiable, the operator being prepared to adopt the necessary treatment in any of these conditions found.
The hydatid cyst may burst in any direction, usually into one of the closed cavities near the liver, and unless the opening is guarded by adhesions, the contents escape into the cavity, with alarming results. Rupture into the pericardium

has always proved fatal.
A common result is for the cyst to rupture into the pleura, and set up inflammation therein; but if the pleurae are joined by adhesions an opening is made into the lung, and the cyst contents are slowly expectorated - many cases being thus cured.
If no adhesions exist, we may have pneumo- or pyo-pneumo-thorax developed.
Or a cavity may form in the lung, which may prove a suitable nidus for the deposition of tubercular virus and the patient be carried off by Consumption.
All these variations are frequently seen in practice in districts infested by hydatid.
The expectoration in such cases reveals its hepatic origin by the sputum and hydatid fluid being bile-stained.
The symptoms following rupture into the peritoneum stomach, intestines and gall-bladder, and the results consequent on such effusion, have been previously described at length (page 5).

The chief points in the differential diagnosis, which distinguish hydatids of the liver from affections resembling them, are the presence of a smooth globular tumour of slow growth, and the fact that the general health is unaffected.
Hepatic abscess is distinguished from it by its rapid onset, its painful character, pyrexia and early cachexia. It may resemble suppurating hydatids, but the history is

different. Cancer of the liver has a less regular contour, is denser and more painful than the hydatid cyst, the health being also gravely deteriorated. Large soft cancers may be mistaken for hydatids – an exploratory puncture sufficing to clear up the diagnosis. Enlargement of the Gall Bladder is to be differentiated from hydatids, by its being usually preceded by more or less jaundice and colic, which rarely accompany the latter disease, except in its advanced stages. It is often difficult to decide between a possible hydatid on the surface of the liver, and effusion into the pleura as in both we observe dulness on percussion, absence of respiratory murmur and vocal resonance and fremitus, dyspnoea, and bulging and fluctuation of the intercostal spaces. The history is different however in both cases. The dulness does not change with the position of the patient in hydatid cyst as it may in pleurisy (Morlies localised by adhesions), and Frerichs (Diseases of the Liver) lays stress on the fact that the upper line of the dulness is different in the two affections, being arched and convex in hydatids, while it is either level or slightly concave in pleuritic effusion. The diagnosis may be complicated by the presence of other cysts in various parts of the body as well as in the liver, the history of the case is of great value in its elucidation. In all doubtful cases the exploratory puncture should be resorted to, as this is perfectly safe if done antiseptically.

As regards the treatment of hydatids of the liver it has been pretty fully described in the general section on treatment.
Much depends on the precise seat of the disease, whether superficial or deep, in selecting one operation in preference to another.
Many cases are cured, as judged by the non-recurrence of the disease, by simple tapping but the uncertainty of this method, as well as its possible riskiness, renders it in many instances merely a means of palliation, when the surgeon or patient fears the performance of a more radical operation.
The safest means of removing the disease is to expose the most prominent part of the tumour, resecting portions of ribs if necessary, and either stitching the sac to the external wound and opening the cyst immediately, or by the application of aseptic gauze around the wound for a few days, to endeavour to obtain adhesions before relieving the cyst of its contents.
In an urgent case, where rupture is imminent, or where there is great dyspnoea or any likelihood of shock, after the double operation, I prefer the former operation; but where one can afford to wait for a few days, the latter method seems to me safer and better.
Should the cyst burst into the peritoneum that cavity should be opened and cleaned, the cyst being removed if possible. Rupture into the pleura demands immediate thoracotomy.

(b) Lung and Pleura. Echinococcus cysts may be found in any part of the lung, though they usually affect the base, either because they naturally gravitate there, or on account of the frequency with with pulmonary hydatids are developed from cysts in the liver.

The general signs of hydatid tumour are well seen in the lungs;- localised or general bulging of one side of the thorax, which does not expand properly with the respiratory movements; along with symptoms of pressure exerted by the tumour in the chest, or of its rupture into the air tubes, or surrounding hollow viscera and cavities.

The measurements of the affected side are occasionally increased.

The respiratory murmurs and vocal fremitus are abolished over the tumour, whose limits can usually be defined by percussion.

The tense feeling over the cyst is very characteristic, & has been previously described.

The breathing is greatly interfered with in advanced cases, the respirations being rapid and shallow so that actual asphyxia may threaten the patient unless relieved.

Around the tumour and on the opposite side of the chest the breathing is puerile.

Cough is an almost constant accompaniment, it is short hard and spasmodic, without expectoration, and is believed to be due to pressure on the bronchial tubes.

An unusually severe attack of coughing may be followed immediately by the rupture of the cyst, and expulsion of its contents,

the fluid portion escaping at once, while the solid parts are expelled more gradually. A day or two before the rupture there may be slight haemoptysis, from the separation of some of the cyst wall and this symptom may be the first to direct our attention to the true state of matters.

The signs of a cavity remain, simulating that produced by pulmonary phthisis. The presence of the hydatid cyst in the lung gives rise to congestion or even to pneumonia of that organ around the tumour - the pneumonia is entirely local, and has no tendency to affect other portions of the lung.

Hydatids of the lung have to be differentiated from Pleurisy, Empyaema, Phthisis, Abscess in lung, Solid tumours and aneurisms of the mediastinum.

The history of the case and the condition of the patient will distinguish the hydatid cyst (if healthy and living) from most of the above-mentioned ailments but should the hydatid have suppurated or burst into surrounding viscera, the diagnosis may be very obscure.

From exudations into the pleural sac, whether serous or purulent, hydatid cyst can be separated by its localised character and defined margin, which is not altered by any position the patient may assume.

Removal of a small quantity of the fluid by aspiration may clear up the diagnosis & may point to the bursting of a cyst into

the pleura. The constitutional symptoms must also be considered.

Perhaps the greatest difficulty exists in distinguishing between <u>early phthisis</u> and <u>hydatid in lung</u>, and mistakes are constantly being made by the best observers. The treatment and prognosis being entirely different in these two affections, much valuable time may be lost and needless apprehension caused to the patient by a wrongful decision between the two conditions.

If the cyst have ruptured into the air cells or bronchi, the case is cleared up by the discovery of cyst-debris in the Sputum, which is pathognomonic of the hydatid disease.

But before this stage is reached, the cough, haemoptysis, localised dulness on percussion, and altered breath sounds common to both affections, prove very confusing. The dulness over the hydatid tumour is commonly situated at the base of the lungs the reverse of what is usually found in phthisis. In the latter affection too there is often <u>retraction</u> of the affected portion of the thoracic wall, while bulging is the rule in hydatid.

The presence of the <u>tubercular bacilli</u> in the Sputum is diagnostic of tubercle, but the examination for bacilli often gives negative results.

Much can be learned by an observation of the progress of the case. If the case does

not markedly improve after being placed under good hygienic surroundings and suitable treatment for a few months, the likelihood of the case turning out to be one of hydatid cyst is increased and an exploratory puncture can be performed, with immediate radical operation if the contents of a cyst are drawn off.
The rule is in these cases always to treat them at first for the Consumption which is the most serious ailment of the two, and then, if the case does not clear up in a short time, to explore the disease, which, if it should prove to be hydatids, is not influenced detrimentally by the period of waiting.
Abscess in the lung may simulate suppurating hydatid cyst of that organ, but as the termination and medical treatment of the two diseases are identical, little need be said about them.
Thoracic aneurism and hydatid of the mediastinum are apt to be confounded, the dry cough, dyspnoea, tremor and pulsation so characteristic of many aortic aneurisms may be produced by, or communicated to, an hydatid cyst contiguous to that vessel.
Similar effects are seen in solid tumours of this region. Aspiration, if considered safe and indicated by any uncertainty in the diagnosis, will serve at once to clear up the case and relieve the patient. Should the tumour turn out to be an aneurism

after all, no more harm is done by the introduction of a hypodermic aspirating needle than by the insertion of instruments for the electrolytic treatment of that disease.

Primary hydatid cysts of the pleura are very rare, but they may extend thence from the liver or lung, or may burst into the pleural cavity from any of the surrounding parts. The symptoms depend in the latter case, on the state of the cyst-contents. If only a small amount of fluid escape into the pleura from a healthy cyst, no worse symptoms than slight fever and a nettle-rash eruption may ensue, while if the effusion is large in amount or decomposed, pyothorax is soon set up, which has proved fatal in nearly every case unless operated on early.
Should the cyst burst into the pleura from the lung, there will possibly be a free communication between the air cells of the lung and the pleural cavity, through which air will pass with each expiration causing Hydro- or pyo-pneumo-thorax.
A somewhat similar result follows the eruption of cysts from the liver, as has may find its way from the duodenum, by way of the bile ducts and the opening through the diaphragm, into the pleura.
The symptoms thus produced are great dyspnoea, hyper-resonance and bulging over affected side, abolition of breath-sounds, while succussion and metallic tinkling sounds are present as well

The treatment of hydatids in the lungs and pleura is invested with special difficulties and dangers on account of their proximity to vital organs, as well as to the fact that they are usually mobile, and derive little support from their surroundings.
In many cases the disease cures itself by rupture into the bronchi by which it is expelled; the treatment being mainly expectant, and resolving itself into the administration of tonics and stimulating expectorants.
Large cysts on the surface of the lung are best suited for operation, either by the production of adhesions and subsequent incision of the cyst, or by its immediate opening followed by the stitching of the sac to the external wound.
The most dependent part of the tumour is selected for the opening on account of the necessity for providing good drainage.
Portions of one or more ribs may be excised, including periosteum.
The danger of rupture of the cyst within the chest, and asphyxia from the sudden flooding of the air tubes, following aspiration or tapping of the cyst, is sufficient to contra-indicate this plan of treatment.
Other dangers from this method are extensive haemorrhage from the degenerated vessels around the sac, which are suddenly relieved from the long continued pressure they had been subjected to; and also the possibility of incomplete evacuation of the cyst and

consequent suppuration and blood poisoning, which have been found in most of the cases which have ended fatally after simple tapping. It is hardly necessary to repeat that all operations on thoracic hydatids must be perfectly aseptic in their technique.

In cases of rupture into the pleura, the chest wall should be opened at once in a dependent position and thoroughly drained: the original hydatid cyst being removed, if possible, by the same opening, if not, by another incision over it. Nothing less than complete extirpation must be aimed at as the danger of leaving any part of the cyst behind is greater than that of any operation ordinarily required for its removal.

When cysts are situated at any depth in the lung tissue their removal is best deferred for a season till they become more superficial, but even in the former locality they have been successfully removed, and the cyst drawn up into the wound and drained.

It is necessary to remove all the hydatids at once from cysts in the thorax, and to drain the cavity, without the use of injections, which set up severe coughing (by irritating the lung tissue) which may destroy the adhesions and even give rise to alarming symptoms of asphyxia.

(c) Abdomen and Pelvis - This region is very liable to hydatids, owing to its relation to the liver and portal circulation, and to the ease of dissemination of multiple hydatids over the surface of the peritoneum. This happens most frequently after tapping of a cyst in the liver, from leakage into the peritoneal cavity of brood capsules and scolices which become implanted in the peritoneum and develope into new cysts. As these bodies gravitate to the bottom of the peritoneal cavity, it is naturally the most dependent parts of the abdomen that are affected with them.

The most favourite situations are the omentum (where they frequently become pedunculated), and the pelvis between the bladder and rectum, or between those organs and the uterus in the female.

We may thus have the peritoneum studded over with any number of hydated cysts of varying size, so that the entire cavity may be filled with cysts which displace and Compress the abdominal organs, and may even cause the respirations to become altogether thoracic, from interference with the movements of the abdominal muscles.

Hydatids in Contact with the alimentary Canal are liable to absorb the intestinal gases and products of decomposition, by a process of osmosis with the result that their contents putrefy and they are converted into abscesses, absorption from which may induce Septicaemia.

The treatment of abdominal hydatids depends entirely on the nature, number and locality of the growths.
Cysts in contact with the anterior wall of the belly are to be treated by Von Volkmann's or Lindemann's method by adhesion or stitching of the sac, which is usually thick and tough in peritoneal hydatids, to the parieties before evacuation.
Pedunculated cysts if hanging free in the abdomen are best treated by ligature of their pedicle and removal
Those tumours which occupy the posterior or lower parts of the abdomen, behind the mentum, or mesentery, or deep in any of the pelvic pouches, are among the most difficult of access and removal in the body.
They have been attended by great fatality from haemorrhage, incomplete removal with defective drainage, and other causes. The main indications in their extirpation seem to be the careful stoppage of all bleeding from the vessels of the capsule, and the aseptic cleansing and drying of the peritoneum before closing the abdominal wound. If these points be attended to, as good results are obtained without as with drainage, which may only prove a vehicle for the introduction of germs into a previously clean abdomen. Should however the hydatid be suppurating, or likely to be so, free drainage is imperative.

(d) Kidney and Supra-renal Capsule. This region is not frequently attacked by hydatids, but when they do occur they generally lead on to complete destruction of the kidney unless one of two things happens either the hydatid cysts cure themselves by spontaneously rupturing into the pelvis of the kidney, or else the disease is recognised early and removed by operation.

The symptoms of renal hydatids may be very insignificant or obscure, as the tumour may cause very little local disturbance or interference with the general health. The urinary secretion is not diminished, for the other kidney puts on compensatory action, and enlarges, just as we saw the unaffected lobes of the liver doing in cysts in that organ.

Hydatids in the kidney may reach a great size before bursting, when their enlargement may be the only sign to attract notice.

They have to be diagnosed from hydatid cysts of the liver on the right side, from ovarian or paro-varian cysts, limited ascites and hydronephrosis.

In elucidating these points we must take into consideration the history of the case, the exact locality and characters of the the tumour and especially the nature of any fluid removed by the aspirating needle for diagnostic purposes. If this fluid should contain, beside the normal hydatid elements, crystals of uric acid,

oxalates, phosphates or tube casts and epithelium its renal origin is clearly proved, and nothing remains but to consider the best means of removing it.

The rupture of a cyst in connection with the kidney is indicated by the subsidence of the previously felt enlargement followed by the escape per urethram of a clear watery fluid, and by symptoms of renal colic from the obstruction of the ureter by portions of the cyst walls, or small complete cysts.

These gradually find their way into the bladder and are expelled with the urine, which on standing deposits hooklets, scolices and debris of hydatids, intimately mixed with blood from the vessels in the kidney torn by the bursting of the tumour. If any cysts are retained in the ureter the urine accumulates behind it and dilates the pelvis of the kidney, producing hydronephrosis; or pyelitis, should suppuration occur, thus greatly retarding the patient's recovery, or even imperilling his life.

The supra-renal capsule is but rarely affected and then usually by multiple hydatids. The symptoms are very obscure. Graham (Hydatid Disease 1891) has described a case in which this body was replaced by a cyst. The patient's skin was of a tawny yellow colour, and there was marked asthenia, resembling, but less pronounced than, that occurring in Addison's Disease.

Other parts of the urinary apparatus are very seldom the seats of hydatid tumours but the bladder or ureter may be subjected to pressure from cysts in the pelvis which may burst into these organs, and be discharged by the urethra.

Pressure on both ureters, if extreme and continuous will cause uraemia; or symptoms of distension of the kidney, if unilateral.

The management of these cases depends on the condition and locality of the tumour. Those which are undergoing removal by the urine require copious diluent drinks as well as diuretics to assist in washing away the obstructions in the passages. Renal colic is to be met with sedatives. Cysts in the kidney are best attacked by a lumbar incision;- as the kidney is uncovered behind by peritoneum, there is no fear of extravasation occuring into that cavity and the cysts can be freely opened & drained antiseptically. If the kidney is found on examination to be destroyed, and its proper tissue replaced by hydatid cyst, it should be removed.

(c) Spleen and Pancreas. - Echinococcus cysts are fairly common in the Spleen, and are usually complicated with similar cysts in the liver or other parts of the abdominal cavity.
We have in such a case a tumour of the Spleen, which, when large, displaces the abdominal and thoracic organs of the left side, and interferes with their functions. Thus we may have dyspepsia or gastritis, from pressure on the stomach; cough and dyspnoea, from compression of the left lung; displacement and irregularity of the cardiac apex beat; interference with the renal or intestinal actions; as well as disturbances produced by the systemic or portal circulations in the abdomen becoming involved.
The tumour has to be diagnosed from enlargement of the Spleen from Leucocythaemia, Malaria, and amyloid disease, from which it may be distinguished mainly by the fact that the general health does not suffer as in the above mentioned ailments, and by the condition of the blood and urine.
The Spleen often enlarges in hepatic hydatid and may give rise to the suspicion of cysts in the spleen itself, whereas the increased size may be owing to passive congestion due to pressure on the portal veins by the hepatic tumour, or to the sympathy between the liver and Spleen, which has been suggested to account for enlargement of the latter organ in like conditions of the former.

The Pancreas is very rarely affected except by implication in cysts of neighbouring organs, or multiple hydatids of the peritoneum. These mask the condition in the pancreas and render the diagnosis of a cyst in that viscus extremely obscure the true state of matters being seldom suspected till the abdomen is explored.

Operations on hydatids of the Spleen especially by tapping, have been attended by a high mortality from the tendency for the cyst to collapse into the abdomen, and the difficulty of procuring adhesions over it. The safest plan is to open the abdomen and expose the tumour, which, if superficial, must be either stitched to the wall of the abdomen and opened, or an attempt made to procure aseptic adhesions. We must be guided in selecting either course by the state of the cyst wall, a tough fibrous sac over the tumour inclining us to the former method, and a friable state of the membranes to the latter. If the splenic or pancreatic tumour is situated too deeply to enable us to employ this means of treatment the only resource is to open the cyst and remove it and its contents as thoroughly as possible to check the bleeding and cleanse the peritoneum before closing the abdomen, and to leave the case to nature.

(f) Heart and Pericardium - Hydatids have been found in various parts of the heart both in the cavities as well as in the substance of the walls and septa. They give rise to symptoms of cardiac oppression, and are rarely diagnosed during life. The usual termination of the case is sudden death from bursting of the cyst into the pericardium or into the blood-stream in the heart, obstructing the valves and vessels. They are entirely beyond the range of treatment.

The pericardium may contain cysts, either independent of, or derived from, those in adjacent organs. The symptoms are those of cardiac cysts.

Mediastinal cysts involving the pericardium have been diagnosed, and removed by an operation in which portions of the sternum and costal cartilages have been resected.

(9) Brain and Spinal Cord - Hydatid tumours are occasionally found in the brain, any part of which may be affected, the cerebrum being the usual locality selected for their growth, they are less often discovered in the ventricles, or meninges or at the base of the brain and very rarely indeed in the cerebellum.

The disease is more common in the young, from 7 to 25 years, but has been seen in infancy and in advanced age.

It causes less interference with the health and consequently grows larger in children, in whom the soft and incompletely sutured bones of the cranium allow the tumour to enlarge with less pain and disturbance than in adults, where the brain tissue suffers more from pressure, and may be largely replaced by cysts.

The symptoms vary with the situation of the tumour in the brain.

Nerves in whose track the tumour lies have their functions interfered with or abolished, thus we may have paresis or paralysis of muscles, disorders of sensation, and trophic changes produced.

Headache is an almost constant symptom, generally frontal, but may be located directly over the cyst. The pain is liable to periodic paroxysms, whose tendency is to get slowly worse.

Accompanying this is more or less dizziness; and vomiting of a cerebral character, not preceded by nausea, is frequently present.

Convulsions are very common in cerebral hydatids both tonic and clonic spasms of the legs, arms and face being reported generally towards the termination of the case.
Vision is more or less interfered with in nearly every recorded example of these cysts within the cranium. The pupils become dilated and insensible to light. The ophthalmoscope reveals post-neuritic atrophy of the disc and retinitis on the same side as the tumour. The blindness in typical cases is only occasional at first - but later on is complete.
Reflex evidence of irritation is given by the patient grinding his teeth at night also by nocturnal screaming, and incontinence of urine and faeces.
The attitude of the patient conveys much information. He prefers lying on the side opposite the tumour, and in walking the gait is uncertain and staggering.
The veins may be enlarged over the tumour, especially when there is any bulging of the cranial bones or between them. The bones themselves may be absorbed entirely or in part by the pressure of the cyst, which may be felt just under the scalp or separated by a thin layer of bone, which crackles like egg-shell under the finger.
The symptoms are thus seen to be those of a slowly growing tumour, or progressive meningitis, with this difference that the disease may be of extraordinary extent without the nutrition of the body suffering in any marked degree.

The differential diagnosis of hydatids in the brain is invested with difficulty, it is only by taking all the symptoms into consideration that any valuable conclusion can be arrived at and even then there is much of the speculative about the case until the condition of the brain is examined and the tumour exposed.

The chief conditions that require to be excluded, in order to arrive at a positive diagnosis of hydatid cyst, are, effusion into the ventricles, solid tumours and abscess of the brain.

In hydrocephalus the head is large from infancy, if the patient be a child, but there is no unilateral headache and bulging such as hydatid so often exhibits, - besides the history is different being of much longer duration in hydrocephalus.

Hydatids are more common at a rather later age (7 years up to 25) than it is usual to find hydrocephalus, which is more frequent before this period, i.e. in childhood.

A solid tumour of the brain is unlikely to distend the cranium, it is more rapid in its progress, and more common in old age than hydatid disease. This applies to sarcomatous growths, but tubercular growths in the brain may also resemble a cyst in the same region. Here we have a history and diathesis of tuberculosis, and it is well to remember that solitary tubercles affect the cerebellum more frequently than the cerebrum, while the converse is true of hydatid tumours.

Abscess of the brain runs a more rapid course and is attended with more pyrexia than hydatid cyst from which there should be little trouble in distinguishing it, except the latter be in a suppurating state, when the two conditions are parallel.
The history of the case, and the fact that abscess does not cause bulging may help us in deciding between the two.
Hydatids may be accompanied by meningitis and the diagnosis thereby complicated.
In all these cases the discovery of hydatids in any other part of the body is of great assistance and a careful examination of the thorax and abdomen is very necessary, but the absence of cysts in these regions is of little value as a negative result, as an hydatid of the brain is often the only manifestation of the disease in the system.

The localisation of hydatid tumour of the brain is less difficult than that of many other lesions, the prominence of the cranium or softening of the bones over the cyst often indicating its position exactly.
To observe this symptom properly the scalp must be shaved beforehand.
The observation of the initiatory phenomena of the convulsive seizures so often occurring in this disease, may point to implication of the motor areas about the Rolandic fissure, or other parts of the cerebral cortex.
Impairment of the functions of centres in the brain, or of cranial nerves before their

exit from the skull also serve to localise the position of the cyst.

The Spinal cord is rarely affected by hydatids, when it is the results are very fatal. The symptoms are those of a tumour, which by pressure on the cord produces paralysis of muscles supplied by the nerves involved, and disorders of sensation which may be either one-sided or bi-lateral. The vertebrae are also liable to be eaten into and absorbed by the growth with more or less collapse of the Spinal column.

Treatment so far has not been attended with much success. The severe headache, which is the most distressing symptom, is relieved by bromides better than by any other drugs. When the cyst can be localised, the skull should be trephined and the cyst if found opened and removed as completely as possible. This is the more easy as the high intra-cranial pressure causes the hydatid to bulge up into the wound. The cyst exhibits pulsations synchronous with the arterial beats, and also rises and falls with respiration.
The operation is extremely fatal, and the rare cases in which the patient survived it did not show any amelioration of the paralysis or blindness which had become permanent. Still, death is certain if the condition remains unrelieved, and for that reason alone the operation is justifiable.

h) Eye and Orbit. This is an extremely rare situation for hydatid disease, only about 50 cases having been hitherto reported. The bulk of these have been collected by Dr. J. Barrett in the Aust. Med. Journal 1892. in a convenient form for reference, and is the best article on the subject we possess.
He divides cysts of the orbit into three classes, 1. Retro-ocular, 2. Subconjunctival, 3. Partaking of the characters of both.
The diagnosis of No. 2 is easy - the cyst is visible as a bluish tumour under the conjunctiva, usually at the retrotarsal fold. In the only case I have seen the eyeball had shrunk in size and vision reduced to perception of light, from the long-continued pressure of the cyst on the globe of the eye. The aspiration of the cyst with a hypodermic syringe discloses its true nature.

Regarding the retro-ocular variety - the signs are less distinctive. The eye-ball is protruded and the conjunctiva is in a chemotic state. Vision is interfered with early, the ophthalmoscope revealing retino-neuritis.
The orbit should be explored in different directions with a hypodermic syringe to extract some of the contents of the cyst, whether clear in the case of living hydatids, or containing pus or debris from degeneration of the parasite. Occasionally the cyst can be felt projecting alongside of the eyeball and under the conjunctiva, but these cases come under the third heading. The tension of the eyeball

is always lowered in hydatid disease.
The treatment is either by repeated tappings or by excision. Both of these are dangerous in cysts deep in the orbit as cellulitis is apt to supervene, often followed by panophthalmitis and total destruction of the eye necessitating its removal.
The subconjunctival variety are easily dissected out and seldom give further trouble, but any impairment of vision due to the pressure of the cyst can rarely be removed.

(i) Ear. Several cases have been reported of hydatid disease in connection with the ear. It is usually the bony wall of the external meatus that is affected, the tumour occupying the substance of the temporal bone, which is expanded & thinned over the cyst. A crackling sensation is communicated to the fingers on pressing the tumour firmly.
The tumour is apt to press on the middle and inner ear, or on the brain, producing aural and cerebral symptoms. Among others we may have deafness, noises in the head, giddiness and vomiting.
The only treatment is the complete evacuation of the cyst which can be accomplished easily as a rule.

(j) Bones and Joints - It is convenient to consider these two structures together as they are seldom attacked separately by hydatids, which commence in one, but soon spread to the other.
Cysts in the bones are fairly numerous, usually developing in the medulla and in the cancellous ends of the long bones. The cyst expands slowly and by a process of absorption of the osseous tissue dilates the bone to an enormous extent and invades neighbouring structures. Of these the first to suffer are usually the joints, in which arthritic changes occur, and the articulation is destroyed. The bone may be entirely absorbed and eventually consist of nothing more than periosteum enclosing the cyst.
The result of this will probably be spontaneous fracture, which is often the first indication of the presence of hydatid disease, or if the case have not advanced as far as this there may be certain places on the surface of the tumour where the thinning of the bone enables a crackling sensation to be brought out on pressure.
The hydatid cyst in bone is extremely tense, and occasions great pain, which is felt worse during the night.
The tumour is seldom of equal consistence in every part, more elastic spots are found here and there, where the bone has been completely eroded, and the cyst has projected into the soft tissues.

The absence of wasting of the limb muscles is of great assistance in distinguishing hydatid disease of the bones or joints from malignant and other affections of the same parts, and the state of the general health has also to be taken into consideration. The importance of an early diagnosis of these cases cannot be overestimated, for while they are perfectly amenable to treatment in their early stages; if they are not recognised until the disease has far advanced it may be impossible to save the limb.

Besides cysts within the bones, we frequently find hydatid disease in other structures invading the substance of neighbouring bones with which it is in contact. Striking examples of this are seen in the flat bones of the cranium in cerebral hydatids, and in the vertebral column from tumours in the thorax and abdomen. The signs are much the same as those of cysts within the bones.

The treatment consists in the entire removal of the disease. If this involves a solution of the continuity of the affected bone the case must be treated as a fracture, and the limb fixed in the best position for union of the fragments. Complete disorganisation of the bones or joints of a limb requires amputation

k) Muscles and Subcutaneous tissues -
These are not rarely affected with hydatid cysts which are usually easily recognised and removed.
The cysts may commence in the above tissues or may invade them from other regions.
The tumour is usually rounded, tense and fluctuating, the surrounding tissues are unaffected with the exception of being slightly indurated by the pressure of the cyst. (vide pp. 12-13.)
The breast is one of the favourite sites for the development of hydatids which sometimes attain great size and may be mistaken for solid tumours or for collections of fluid in that gland.
There is no retraction of the nipple in hydatid of the breast. Incision and evacuation cures it.
Three cases have been reported of cysts in the breast and axilla, pressing on the axillary artery and causing clotting of that vessel with fatal haemorrhage.
The muscles of the back are frequently the seats of hydatid tumours which are most apt to be confounded with lipomas of that region.

Appendix.

Copy of Circular from Central Board of Health Melbourne.

19th May 1885.

Sir, – The question of impure water supplies has been latterly on more than one occasion, carefully considered by this Board, and it is believed that a large quantity of water in daily use is unfit for human consumption unless precautions are taken.

It is known that hydatid disease is on the increase in Victoria, and that many valuable lives are annually lost from want of a little knowledge and care.

In Quain's Dictionary of Medicine, it is stated that in Ireland, which is more infected with hydatid disease than any other country in the world, twenty-eight per cent. of the dogs are affected by it, and of the human subject one-sixth of the annual deaths are from hydatids. It is further stated that probably Victoria is already the second most infected territory.

The Central Board desires to point out that in drinking open natural waters or eating vegetables to which dogs have access, all persons – but especially children – run a great risk of incurring hydatid disease, with all its consequent dangers.

The Board strongly recommends that all such water be first thoroughly boiled; and persons living in the country, or travellers, should avoid drinking from waterholes or swampy water of any kind without such precaution, and in all cases the water supply for domestic use should be guarded against the invasion of dogs. Dogs should not be allowed to swim in reservoirs, or, where possible to prevent it to drink from the same supply as man, sheep, cattle, or pigs.

It is highly important to remember that the purest-looking water may contain numerous

hydatid germs. Hence the importance of boiling the water where there is any risk.
It is desirable to bury or throw boiling water over the exposed faeces of dogs, and chained dogs should have their kennels and the ground for some distance round purified frequently with boiling water. Dogs should never be fed with nor allowed the opportunity of eating the offal of slaughter-houses, nor should pigs be kept there.
The laws against unregistered dogs should be strictly enforced.
It should be known that hydatid disease can be communicated to the human subject by impure salads or vegetables (unlooked), and care should be taken to wash and thoroughly cleanse everything of the kind before it is eaten.
Water-cress from drains should never be eaten.
Fluke in sheep is another source of danger, and such mutton should be carefully avoided.
Further it should be known that there is risk of contracting the disease in allowing dogs to lick the hands or faces of children or adults, and in permitting them to lick plates and dishes.
In all this, as in many other cases, "cleanliness is one of the most important preventives against infection."

I have the honour to be,
Sir,
Your most obedient servant,
J. W. Colville,
Secretary,
Public Health Department.

Dr J. A. Neptune Scott,
Warrnambool.